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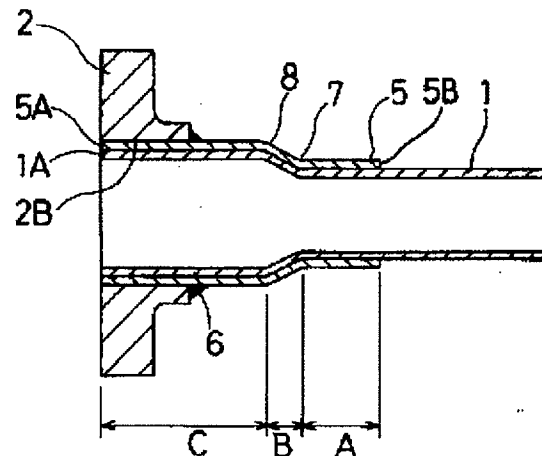
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(54) 【発明の名称】 排気管の継手構造と製造方法

(57) 【要約】

【目的】 排気管と継手フランジの結合部の強度を増加し、排気管などに亀裂が入るのを防止する。製造を容易にしてコストダウンをする。

【構成】 排気管1に補強管5を嵌合し、B部をテーパに拡管し、C部を更に大きく拡管する。排気管1と補強管5は密着した二重管のかたちそのままに拡管されるので、折曲り部7、8で薄肉になっても、応力が分散され強度を保つ。両管の先端部は継手フランジ2の挿入孔2Bに嵌合して溶接固定する。



## 【特許請求の範囲】

【請求項1】 排気管（1）の端部を拡張して継手フランジ（2）に溶接固定する排気管の継手構造において、排気管（1）の端部に該排気管（1）と一体的に同時拡張された補強管（5）が、前記排気管（1）の拡張部（C）と徐変径部（B）と一般径部（A）とにわたって密着外嵌されていることを特徴とする排気管の継手構造。

【請求項2】 継手フランジ（2）の挿入孔（2B）に、拡張された排気管（1）と補強管（5）の端部とが一体的に挿入されて溶接固定されていることを特徴とする請求項1記載の排気管の継手構造。

【請求項3】 排気管（1）の端部に補強管（5）を嵌合してから、排気管（1）の先端部（1A）と反対の側の補強管（5）の端部（5B）を原管径のままとし、それより排気管（1）の先端部（1A）に向かって次第に両管（1）（5）を同時拡張して、二重の密着管となし、その先端部（1A）（5A）を継手フランジ（2）に溶接固定したことを特徴とする排気管の継手部分の製造方法。

【請求項4】 排気管（1）の端部を拡張して継手フランジ（2）に溶接固定する排気管の継手構造において、排気管（1）の端部に長い第1の補強管（5）と短い第2の補強管（9）を順に嵌合し、排気管（1）と第1の補強管との二重管部分に一般径部（A）に隣接して第1の徐変径部（B）を拡張形成し、更にこの徐変径部（B）に隣接して、排気管（1）と第1・第2の補強管（5）（9）の三重管部分に第1の拡張部（C）と第2の徐変径部（D）と第2の拡張部（E）とを順に隣接して形成し、第2の拡張部（E）の排気管と両補強管（5）（9）の端部を継手フランジ（2）に固定したことを特徴とする排気管の継手構造。

## 【発明の詳細な説明】

## 【0001】

【産業上の利用分野】 本発明は自動車等のエンジンに用いる排気管の継手構造と製造方法に関する。

## 【0002】

【従来の技術】 自動車エンジンの排気管継手構造としては、実公平5-13940号公報（以下第1の従来技術という）や、実公平5-19536号公報（以下第2の従来技術という）に示すものが知られている。

【0003】 第1の従来技術は、図8に示すように、排気管1の端部に、外拡がりのフレア部1Aが形成されている。また継手フランジ2に、先端に行くに従って細くなるテーパ状の円筒部2Aが形成され、フレア部1Aの内側に重なって嵌合している。円筒部2Aの先端とフレア部1Aの内側面に環状凹部3が形成され、溶接されている。

【0004】 第2の従来技術は、真円筒形の排気管1の端部を継手フランジ2に嵌合して溶接し、排気管1とは

別体に形成した補強サポート4を排気管1の外周1Bに被せて、一端4Aを継手フランジ2の一面2Aに溶接するとともに他端4Bを排気管1に溶接している。

【0005】 このようにして、両従来技術とも、継手フランジに溶接した排気管の破損を防止せんとしている。

## 【0006】

【発明が解決しようとする課題】 しかし、前記第1の従来技術では、継手フランジにテーパ状の円筒部2Aを形成する必要があるために、既存の継手フランジが利用できないとか、排気管1のフレア部1Aと原管部との境界1Cが加工時に肉厚減少して、ここに応力が集中して破損しやすいという問題点があった。

【0007】 また、第2の従来技術では、排気管1と補強サポート4の密着性が低いため、応力が補強サポート端部4A、4Bの溶接部分に集中し、この端部が破損しやすいとか、補強サポート4を排気管1とは別体に製造する必要があるばかりでなく溶接箇所が多いので、製造難、コスト高、重量増等の問題点があった。

【0008】 そこで、本発明はこのような問題点を解消できる排気管と継手フランジとの継手構造とその製造方法を提供することを目的とする。

## 【0009】

【課題を解決するための手段】 前記目的を達成するために、第1の発明の継手構造は、排気管（1）の端部を拡張して継手フランジ（2）に溶接固定する排気管の継手構造において、排気管（1）の端部に該排気管（1）と一体的に同時拡張された補強管（5）が、前記排気管（1）の拡張部（C）と徐変径部（B）と一般径部（A）とにわたって密着外嵌されていることを特徴とする。

【0010】 また第2の発明の継手構造は、第1の発明において、継手フランジ（2）の挿入孔（2B）に、拡張された排気管（1）と補強管（5）の端部とが一体的に挿入されて溶接固定されていることを特徴とする。

【0011】 そして、第3の発明の製造方法は、排気管（1）の端部に補強管（5）を嵌合してから、排気管（1）の先端部（1A）と反対の側の補強管（5）の端部（5B）を原管径のままとし、それより排気管（1）の先端部（1A）に向かって次第に両管（1）（5）を同時拡張して、二重の密着管となし、その先端部（1A）（5A）を継手フランジ（2）に溶接固定したことを特徴とする。

【0012】 そしてまた第4の発明の継手構造は、排気管（1）の端部を拡張して継手フランジ（2）に溶接固定する排気管の継手構造において、排気管（1）の端部に長い第1の補強管（5）と短い第2の補強管（9）を順に嵌合し、排気管（1）と第1の補強管との二重管部分に一般径部（A）に隣接して第1の徐変径部（B）を拡張形成し、更にこの徐変径部（B）に隣接して、排気管（1）と第1・第2の補強管（5）（9）の三重管部

分に第1の拡張部(C)と第2の徐変径部(D)と第2の拡張部(E)とを順に隣接して形成し、第2の拡張部(E)の排気管と両補強管(5)(9)の端部を継手フランジ(2)に固定したことを特徴とする。

【0013】

【作用】排気管(1)に重ねて嵌合した補強管(5)が、排気管の一般径部(A)、徐変径部(B)及び拡張部(C)にわたり、排気管端部に密着して実質的な肉厚増加による断面係数の増加となり、管端部の強度をあげる。しかも径が急変する薄肉部も肉厚増加により補強され、応力集中が避けられる。

【0014】第4の発明では、第2の補強管が、更に三重管を構成して、より強度向上と応力分散をする。

【0015】

【実施例】図1の第1実施例では符号Aで示す範囲の部分の一般径(原管径)の排気管に補強管5を嵌合し、一般径部Aに隣接する符号Bと、更にその部分Bに隣接する符号Cの部分の両管1と5をともに拡張する。

【0016】このとき、範囲Bは、径を次第に大きくする徐変径部としてテーパ状に形成し、Cの部分は拡張部として最大径に加工する。このような加工は二重に重ねた両管1と5をメス型に入れて、排気管1の内側にゴム等の弾性体を押し込んでバネ加工する方法で行なう。また、ポンチ等の割り型で内側から拡張するエキスパンド加工でもよい。

【0017】このようにして、密着した二重管の形で徐変径部Bと拡張部Cを形成したあと、冷間鍛造の継手フランジ2の挿入孔に両管1, 5の端部1Aと5Aを一体的に挿入して継手フランジ2に溶接固定する。符号6はこの溶接を示す。

【0018】なお、両管1と5は互にスポット溶接して、密着性を高めることもできる。図1の第1実施例は、1段の拡張が行なわれ、折れ曲り部7と8で両管1と5に薄肉部が生じるが、密着二重管にすることで応力分散がされ、強度が増す。

【0019】図2の第2実施例は、排気管1に補強管5を嵌合して密着二重管にすることは前記第1の実施例と同じであるが、この第2実施例では、2箇所の徐変径部B<sub>1</sub>, B<sub>2</sub>と、2箇所の拡張部C<sub>1</sub>, C<sub>2</sub>とで、2段に拡張している点異なる。

【0020】図3の第3実施例は、前記第4の発明に対応し、長い第1の補強管5と、短い第2の補強管9とを排気管1に順に嵌合して重ね、密着三重管とするとともに、第2実施例と同様に2段階に拡張している。このとき、第2の補強管は、すべての範囲にわたって拡張される。

【0021】なお、第3実施例では密着三重管で2段拡張しているが、更に密着四重管で3段拡張するなど、補強管の数を増加し、拡張の段数を増加することができる。図4の第4実施例は、図1の第1実施例と比較して、徐変径部Bがテーパ状でなくて内側からの球面と、外側からのR面とで構成されている点異なるが、補強作用は類似である。

【0022】図5の第5実施例は、図2の第2実施例と比較して第2の徐変径部B<sub>2</sub>に相当する部分が球面で構成されている点異なる。図6の第6実施例は図1の第1実施例と比較して、徐変径部のテーパ部が排気管1の軸方向に長く広い範囲に形成されている点異なる。

【0023】図7の第7実施例は排気管1と補強管5とを重ねた密着二重管を拡張し、それらの端部を継手フランジ2の片側2Aに溶接固定しており、その他の点は図1の第1実施例と同様である。

【0024】

【発明の効果】本発明の排気管の継手構造は上述のように構成されているので、拡張により排気管の肉厚が薄くなる部分でも補強管が密着した多重管構造となって、応力が分散されるため、フランジ溶接部、折れ曲り部、徐変径部での亀裂発生がないうえに、排気管一般部の肉厚を薄くすることが可能で、軽量化とコスト低減が図れる。又、既存フランジが使用でき、補強管を別に製作する必要がなく、排気管と同時に加工でき、しかも一般的な拡張加工工程だけで済むため製造が容易で、この面からもコスト安になる。

【図面の簡単な説明】

【図1】本発明の第1実施例の縦断面図。

【図2】本発明の第2実施例の縦断面図。

【図3】本発明の第3実施例の縦断面図。

【図4】本発明の第4実施例の縦断面図。

【図5】本発明の第5実施例の縦断面図。

【図6】本発明の第6実施例の縦断面図。

【図7】本発明の第7実施例の縦断面図。

【図8】従来技術の縦断面図。

【図9】他の従来技術の縦断面図。

【符号の説明】

1 排気管

1A, 5A 先端部

2 継手フランジ

5, 9 補強管

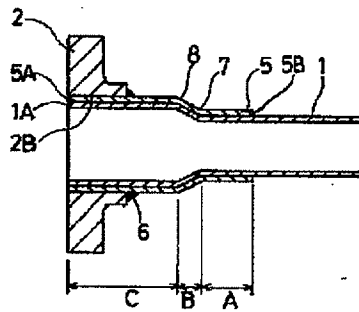
7, 8 折れ曲り部

A 一般径部

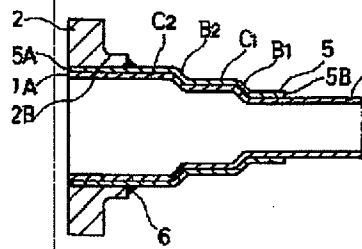
B, B<sub>1</sub>, B<sub>2</sub>, D 徐変径部

C, C<sub>1</sub>, C<sub>2</sub>, E 拡張部

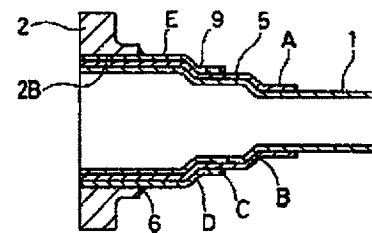
【図1】



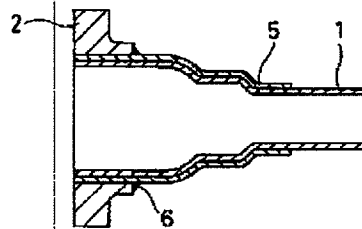
【図2】



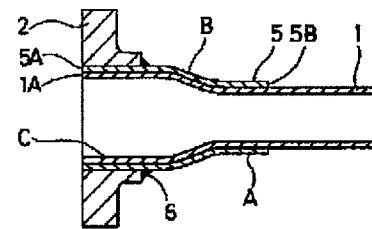
【図3】



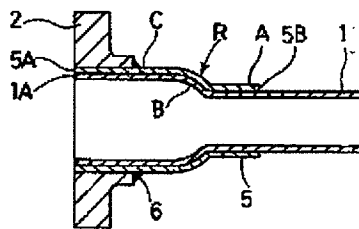
【図5】



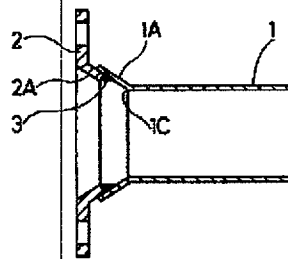
【図6】



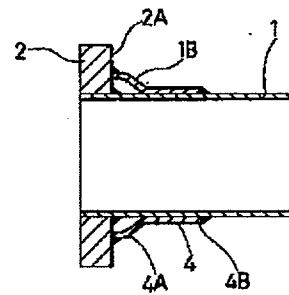
【図4】



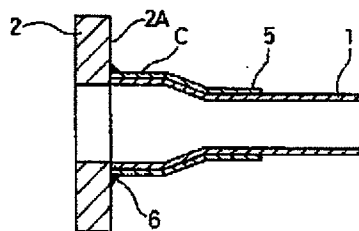
【図8】



【図9】



【図7】



# PATENT ABSTRACTS OF JAPAN

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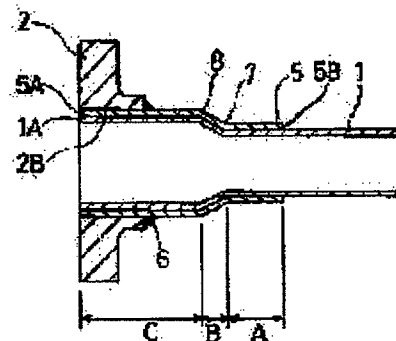
(72)Inventor : IZUHARA KOICHI

## (54) JOINT STRUCTURE OF EXHAUST PIPE AND ITS MANUFACTURE

### (57)Abstract:

**PURPOSE:** To prevent an exhaust pipe from cracking by increasing the strength of a coupling part between an exhaust pipe and a joint flange, and to reduce manufacturing cost by simplifying its manufacture.

**CONSTITUTION:** A reinforcing pipe 5 is fitted on an exhaust pipe 1, and a B part is expanded into a gradient shape, and a C part is expanded further wider. Since the exhaust pipe 1 and the reinforcing pipe 5 are expanded as they are a double pipe adhering closely each other, even when they become thin in bent parts 7, 8, stress is dispersed, and the bent parts 7, 8 thereby maintain proper strength. The tips of both the pipes are fitted into the inserting hole 2B of a joint flange 2 and fixed by welding.



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## CLAIMS

### [Claim(s)]

[Claim 1]In joint structure of an exhaust pipe which expands the diameter of an end of an exhaust pipe (1), and carries out welding immobilization at a coupling flange (2), Joint structure of an exhaust pipe which carries out that adhesion outside attachment of the reinforcement pipe (5) by which simultaneous diameter expansion was carried out in one with this exhaust pipe (1) is carried out over an expanding part (C), a gradual change diameter (B), and a general diameter (A)

of said exhaust pipe (1) to an end of an exhaust pipe (1) with the feature.

[Claim 2]Joint structure of the exhaust pipe according to claim 1, wherein an end of an exhaust pipe (1) and a reinforcement pipe (5) which were expanded is inserted in an insertion hole (2B) of a coupling flange (2) in one and welding immobilization is carried out.

[Claim 3]After fitting a reinforcement pipe (5) into an end of an exhaust pipe (1), a tip part (1A) of an exhaust pipe (1) and an end (5B) of a reverse near reinforcement pipe (5) are considered as as [ a diameter of an original pipe ], A manufacturing method of a joint part of an exhaust pipe which carries out simultaneous expansion of both the pipes (1) and (5) gradually toward a tip part (1A) of an exhaust pipe (1) from it, and is characterized by carrying out welding immobilization of [ a double adhesion pipe and nothing ], and its tip part (1A) (5A) at a coupling flange (2).

[Claim 4]In joint structure of an exhaust pipe which expands the diameter of an end of an exhaust pipe (1), and carries out welding immobilization at a coupling flange (2), The 1st long reinforcement pipe (5) and the 2nd short reinforcement pipe (9) are fitted into an end of an exhaust pipe (1) in order, Adjoin a general diameter (A) at a double pipe portion of an exhaust pipe (1) and the 1st reinforcement pipe, and carry out expansion formation of the 1st gradual change diameter (B), and this gradual change diameter (B) is adjoined further, Adjoin 3 detonator portions of an exhaust pipe (1), the 1st-2nd reinforcement pipe (5), and (9) in order, and the 1st expanding part (C), and the 2nd gradual change diameter (D) and 2nd expanding part (E) are formed in them, Joint structure of an exhaust pipe fixing an end of an exhaust pipe of the 2nd expanding part (E), both reinforcement pipes (5), and (9) to a coupling flange (2).

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[Translation done.]

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## DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Industrial Application]This invention relates to the joint structure and the manufacturing method of an exhaust pipe which are used for engines, such as a car.

[0002]

[Description of the Prior Art]As exhaust pipe joint structure of an automobile engine, what is shown in JP,5-13940,Y (henceforth the 1st conventional technology) and JP,5-19536,Y (henceforth the 2nd conventional technology) is known.

[0003]As the 1st conventional technology is shown in drawing 8, the flare part 1A of the outside spread is formed in the end of the exhaust pipe 1. The tapered shape body 2A which becomes thin was formed in the coupling flange 2 as it went at the tip, and it has lapped and fitted in inside the flare part 1A. The annular recess 3 is formed and welded to the tip of the body 2A, and the medial surface of the flare part 1A.

[0004]It fits into the coupling flange 2 and the end of the exhaust pipe 1 of a perfect circle cartridge is welded, and in the exhaust pipe 1, the 2nd conventional technology puts the reinforcement support 4 formed in the different body on the periphery 1B of the exhaust pipe 1, and it is welding the other end 4B to the exhaust pipe 1 while it welds the one end 4A to the

whole surface 2A of the coupling flange 2.

[0005] Thus, breakage of the exhaust pipe which welded both conventional technologies to the coupling flange tends to be prevented.

[0006]

[Problem(s) to be Solved by the Invention] However, since it is necessary to form the tapered shape body 2A in a coupling flange in said 1st conventional technology, The existing coupling flange could not be used, or the boundary 1C between the flare part 1A of the exhaust pipe 1 and an original pipe part carried out wall thickness reduction at the time of processing, and there was a problem of stress having concentrated here and being easy to damage.

[0007] Since the adhesion of the exhaust pipe 1 and the reinforcement support 4 is low in the 2nd conventional technology, It is necessary not only to manufacture the reinforcement support 4 to a different body in the exhaust pipe 1, but in if stress concentrates on the welded section of the reinforcement support ends 4A and 4B and it is easy to damage this end, since there were many welded places, there were problems, such as manufacture difficulty, a high cost, and increase of weight.

[0008] Then, an object of this invention is to provide the joint structure and its manufacturing method of the exhaust pipe and coupling flange which can cancel such a problem.

[0009]

[Means for Solving the Problem] In order to attain said purpose, joint structure of the 1st invention, In joint structure of an exhaust pipe which expands the diameter of an end of an exhaust pipe (1), and carries out welding immobilization at a coupling flange (2), Adhesion outside attachment of the reinforcement pipe (5) by which simultaneous diameter expansion was carried out in one with this exhaust pipe (1) is carried out at an end of an exhaust pipe (1) over an expanding part (C), a gradual change diameter (B), and a general diameter (A) of said exhaust pipe (1).

[0010] In the 1st invention, an end of an exhaust pipe (1) and a reinforcement pipe (5) which were expanded by insertion hole (2B) of a coupling flange (2) is inserted in one, and welding immobilization of the joint structure of the 2nd invention is carried out.

[0011] And after a manufacturing method of the 3rd invention fits a reinforcement pipe (5) into an end of an exhaust pipe (1), Consider a tip part (1A) of an exhaust pipe (1), and an end (5B) of a reverse near reinforcement pipe (5) as as [ a diameter of an original pipe ], and simultaneous expansion of both the pipes (1) and (5) is gradually carried out toward a tip part (1A) of an exhaust pipe (1) from it, Welding immobilization of [ a double adhesion pipe and nothing ], and its tip part (1A) (5A) was carried out at a coupling flange (2).

[0012] And in joint structure of an exhaust pipe which joint structure of the 4th invention expands the diameter of an end of an exhaust pipe (1), and carries out welding immobilization again at a coupling flange (2), The 1st long reinforcement pipe (5) and the 2nd short reinforcement pipe (9) are fitted into an end of an exhaust pipe (1) in order, Adjoin a general diameter (A) at a double pipe portion of an exhaust pipe (1) and the 1st reinforcement pipe, and carry out expansion formation of the 1st gradual change diameter (B), and this gradual change diameter (B) is adjoined further, 3 detonator portions of an exhaust pipe (1), the 1st-2nd reinforcement pipe (5), and (9) were adjoined in order, the 1st expanding part (C), and the 2nd gradual change diameter (D) and 2nd expanding part (E) were formed in them, and an end of an exhaust pipe of the 2nd expanding part (E), both reinforcement pipes (5), and (9) was fixed to a coupling flange (2).

[0013]

[Function] The general diameter (A) and gradual change diameter (B) and expanding part (C) of an exhaust pipe are covered, and the reinforcement pipe (5) which fitted into the exhaust pipe (1) in piles sticks to an exhaust pipe end, serves as an increase in the section modulus by substantial thick increase, and raises the intensity of tube ends. And the thin-walled part in which a path changes suddenly is also reinforced by thick increase, and stress concentration is avoided.

[0014] In the 4th invention, the 2nd reinforcement pipe constitutes further 3 detonators, and carries out improving strength and stress distribution more.

[0015]

[Example] In the 1st example of drawing 1, the reinforcement pipe 5 is fitted into the exhaust pipe of the diameter (diameter of an original pipe) of general of the portion of the range shown with the numerals A, and the diameter of both the pipes 1 and 5 of both is expanded for the portions of the numerals B which adjoin the general diameter A, and the numerals C which adjoin the portion B further.

[0016] At this time, the range B forms a path in tapered shape as a gradual change diameter enlarged gradually, and processes the portion of C into an overall diameter as an expanding part. Such processing puts both the doubly piled-up pipes 1 and 5 into a negative form, and is performed by pushing in and carrying out bulging of the elastic bodies, such as rubber, inside the exhaust pipe 1 etc. Expanded processing extended from the inside with rate types, such as punch, may be sufficient.

[0017] Thus, after forming the gradual change diameter B and the expansion part C in the form of the stuck double pipe, the ends 1A and 5A of both the pipes 1 and 5 are inserted in the insertion hole of the coupling flange 2 of cold forging in one, and welding immobilization is carried out at the coupling flange 2. The numerals 6 show this welding.

[0018] Spot welding of both the pipes 1 and 5 can be carried out to \*\*, and they can also improve adhesion. Although one step of diameter expansion is performed and a thin-walled part arises in both the pipes 1 and 5 in the crimp parts 7 and 8, stress distribution is carried out by using an adhesion double pipe, and intensity of the example [ 1st ] of drawing 1 increases.

[0019] Although it is the same as that of said 1st example to fit into the exhaust pipe 1 and to use the reinforcement pipe 5 as an adhesion double pipe of the 2nd example of drawing 2 at it, in this 2nd example, it is with two gradual change diameter  $B_1$ ,  $B_2$ , and two expanding part  $C_1$  and  $C_2$ , and differs in that the diameter is expanded to two steps.

[0020] It is expanded to two steps like the 2nd example while the 3rd example of drawing 3 corresponds to said 4th invention, fits into the exhaust pipe 1 in order, puts the 1st long reinforcement pipe 5 and the 2nd brief reinforcement pipe 9 on it and uses them as adhesion 3 detonator. At this time, the 2nd reinforcement pipe is expanded over all the ranges.

[0021] Although two steps are expanded with adhesion 3 detonator in the 3rd example, the number of reinforcement pipes can be increased by expanding three steps with adhesion 4 detonator etc., and the number of stages of expansion can be increased. The reinforcing operation is similar although it differs in that the gradual change diameter B is not tapered shape, and the 4th example of drawing 4 comprises a surface of a sphere from the inside, and an R side from the outside as compared with the 1st example of drawing 1.

[0022] The 5th example of drawing 5 differs in that the portion which is equivalent to 2nd gradual change diameter  $B_2$  as compared with the 2nd example of drawing 2 comprises a surface of a sphere. It differs in that the 6th example of drawing 6 is formed at the range with it as compared with the 1st example of drawing 1. [ a taper part of a gradual change diameter long to the shaft orientations of the exhaust pipe 1, and ] [ wide ]

[0023] The 7th example of drawing 7 expands the adhesion double pipe on which the exhaust pipe 1 and the reinforcement pipe 5 were put, welding immobilization of those ends is carried out at one side 2A of the coupling flange 2, and other points are the same as the 1st example of drawing 1.

[0024]

[Effect of the Invention] Since the joint structure of the exhaust pipe of this invention is constituted as mentioned above, it becomes the multiple pipe structure which the reinforcement pipe stuck and stress is distributed also in the portion to which the thickness of an exhaust pipe becomes thin by expansion, It is possible for there to be no fear of the crack development in a flange weld zone, a crimp part, and a gradual change diameter, and also to make thickness of an exhaust pipe general part thin, and a weight saving and cost reduction can be planned. The existing flange can be used, and it is not necessary to manufacture a reinforcement pipe independently, and can be processed simultaneously with an exhaust pipe, and moreover, since only a general diameter expansion work process is required, manufacture is easy and becomes cost \*\* also from this field.



[Translation done.]

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**DESCRIPTION OF DRAWINGS**

[Brief Description of the Drawings]

[Drawing 1]Drawing of longitudinal section of the 1st example of this invention.

[Drawing 2]Drawing of longitudinal section of the 2nd example of this invention.

[Drawing 3]Drawing of longitudinal section of the 3rd example of this invention.

[Drawing 4]Drawing of longitudinal section of the 4th example of this invention.

[Drawing 5]Drawing of longitudinal section of the 5th example of this invention.

[Drawing 6]Drawing of longitudinal section of the 6th example of this invention.

[Drawing 7]Drawing of longitudinal section of the 7th example of this invention.

[Drawing 8]Drawing of longitudinal section of conventional technology.

[Drawing 9]Drawing of longitudinal section of other conventional technologies.

[Description of Notations]

1 Exhaust pipe

1A and 5A Tip part

2 Coupling flange

5 and 9 Reinforcement pipe

7, 8 crimp parts

A General diameter

B, B<sub>1</sub>, B<sub>2</sub>, and D Gradual change diameter

C, C<sub>1</sub>, C<sub>2</sub>, and E Expanding part

[Translation done.]

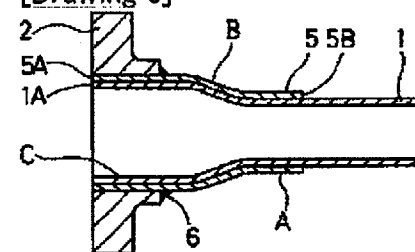
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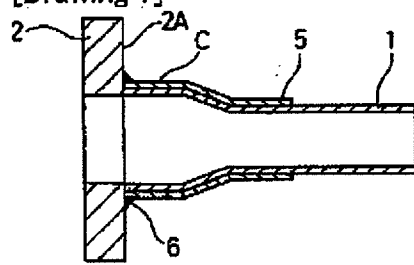
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**DRAWINGS**

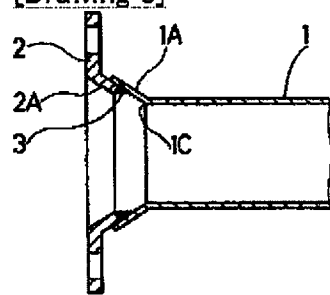
[Drawing 1]



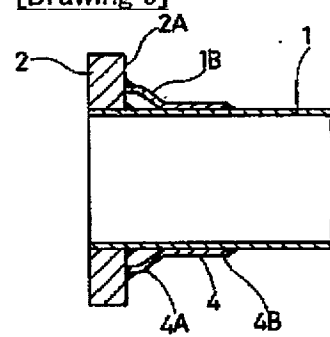
[Drawing 7]



[Drawing 8]



[Drawing 9]



[Translation done.]